ATTACHMENT A

Remarks

By this Amendment, independent claims 1 and 2 have been amended for clarity and to better define the invention in accordance with US practice, and new independent method claim 3 and apparatus claim 4 have been added. It is submitted that the present application is in condition for allowance for the following reasons.

In the *Claim Rejections - 35 USC § 102* section of the Detailed Action, independent claims 1 and 2 were rejected under 35 USC § 102 as being anticipated by the Aoto patent. However, for the following reasons, it is submitted that these claims are allowable over this reference.

Initially, it will be noted that the present invention as claimed in independent claims 1 and 2 relates to the manufacturing of mechanical resonators having a planar monolithic vibrating structure made of a crystalline material. The claims propose a general solution for manufacturing such a resonator from any crystalline material. To this end, the claims recite relations between three data: the types of crystalline materials, the cut plane(s) of materials for each type, and the vibration mode(s) for each cut plane. In this manner, one is able to determine a mechanical resonator which exhibits natural material-based frequency isotropy whatever the crystalline material may be in accordance with the present invention.

With reference to WO 01/55675 (mentioned as prior art in the description and cited/provided in the PCT/ISR), this reference helps to point out clearly what the invention provides exactly, and hence how it differs from the Aoto patent cited by the Examiner. In particular, it will be appreciated that WO 01/55675 gives only a specific teaching that: (i) relates only to an annular vibrating member made of silicon, when a multiplicity of crystalline materials

exist; and (ii) the frequency isotropy of the annular vibrating member for a 2nd-order vibration mode can be obtained only for a cut plane [111] of the silicon crystal, when it is the cut plane [100] that is currently used by the manufacturer, which cut plane leads to implement a 3rd-order vibration mode. It will also be noted that both of these silicon crystals are positively excluded from the claims of the present invention.

Thus, the specific teachings of WO 01/55675 are particular, and do not suggest any other possibilities. In particular, while those of ordinary skill in the art may know that a vibrating member of a gyroscopic structure may also be made of quartz, and while they may also desire to manufacture vibrating members having a shape other than annular, such possible variants are not suggested in WO 01/55675 and consequently no solution is provided on these points. Moreover, WO 01/55675 mentions only a cut plane [100] with a 3d-order vibration mode for an annular vibrating member made of silicon, and it does not mention none other cut planes (such as [001] or [010]).

In such a circumstance, a person skilled in the art is led by WO 01/55675 to implement exclusively an annular vibrating member made of silicon worked in a cut plane [100], with a 3d-order vibration mode. A person skilled in the art does not receive from WO 01/55675 any information nor suggestion regarding other crystalline materials, and/or other cut planes, and/or otherwise shaped vibrating members. And even if a person skilled in the art would have a desire to implement crystalline materials other than silicon, this document does not provide any information or suggestions regarding ways to be accomplish that.

In view of the above, it will thus be appreciated exactly what the problem is which the present invention solves. In particular, notwithstanding the specific knowledge of the implementation of silicon and quartz, the problem remains of how one could define and

manufacture – for all crystalline materials, cut plane(s) and vibration mode(s) – mechanical resonators having a natural frequency isotropy. The specific content of WO 01/55675 and the lack of other documents regarding this matter all show that there was no known relationship between the cut plane(s) of each crystalline material, the vibration mode(s) of the resonator, and the frequency isotropy of the resonator; and this is true not only for the sole material silicon, but also for all crystalline materials.

Thus, in view of above comments, it becomes clear that the Aoto patent cited by the Examiner is not relevant to the problem and solution of the present invention as claimed in independent claims 1 and 2. The Aoto patent solely relates to the manufacturing of a single-crystal piezo material, BaTiO3, with only a mention of the cut plane [100]. And as known by those of ordinary skill, such a material has a tetrahedral crystalline structure. Consequently, the Aoto patent relates solely to manufacturing such a material, but not to the using of this material for manufacturing any member. *A fortiori*, this document does not recite implementing this material for manufacturing a mechanical resonator with a planar monolithic vibrating structure. As a result, the Aoto patent does not relate in any way to the objective achieved according to the present invention as recited in the claims.

It should also be appreciated that the Aoto patent, due exactly to the fact that it does not relate to manufacturing a mechanical resonator with a vibrating structure, mentions no vibration modes in relation with the cut plane [100] cited therein. Consequently, this document provides no information or teachings in the field of the present invention as recited in claims 1 and 2.

Therefore, the Aoto patent does provide any teaching regarding all crystalline materials so as to associate together the material crystalline structure, at least one cut plane of this material, and at least one vibration mode in relation with this cut plane as claimed in claims 1 and 2.

Consequently the Aoto patent does not teach or make obvious the inventions of claims 1 and 2 so that these claims are allowable.

It will be noted that new independent claims 3 and 4 have also been added. These claims are similar to respective independent claims 1 and 2, but do not also include the crystalline materials of cubic structure cut in the [111] plane where the 2nd-order vibration mode is then used, or cut in the [100] plane where the 3rd-order vibration mode is then used. These claims are thus also allowable for the same reasons as discussed above for independent claims 1 and 2.

For all of the foregoing reasons, it is submitted that the present application is in condition for allowance and such action is solicited.

ATTACHMENT B

Amendments to the Claims

This listing of claims will replace all prior versions, and listings, of claims in the application.

1. (currently amended) A method for producing a mechanical resonator with a planar monolithic vibrating structure machined in a crystalline material, ~~characterized in that~~comprising the steps of:

when the crystalline material is chosen from crystalline materials of trigonal (1) or trigonal (2) ~~or hexagonal~~ structure, this material is cut in the [001] plane ~~or~~, ~~when it is chosen from materials of cubic structure (silicon excluded), it is cut in the [111] plane,~~ and the 2nd-order vibration mode is then used, ~~or else~~

when the crystalline material is chosen from crystalline materials of tetragonal (1) or tetragonal (2) ~~or hexagonal~~ structure, this material is cut in the [001] plane, ~~or,~~ and the 3rd-order vibration mode is then used,

when the crystalline material is chosen from crystalline materials of hexagonal structure, this material is cut in the [001] plane, and the 2nd-order or 3rd-order vibration mode is then used,

when ~~it~~ the crystalline material is chosen from crystalline materials of cubic structure other than silicon, it is either a) cut in the [111] plane, and the 2nd-order vibration mode is then used, or b) cut in the [100] plane, and the 3rd-order vibration mode is then used, and

when the crystalline material is chosen from crystalline materials of cubic structure, it is cut in the [001] ~~or [100] plane (silicon excluded)~~ or [010] plane, and the 3rd-order vibration mode is then used,

whereby the resonator exhibits natural material-based frequency isotropy ~~(~~$\Delta f_m = 0$~~)~~.

2. (currently amended) A mechanical resonator with a planar monolithic vibrating structure machined in a crystalline material, ~~characterized in that, for~~

wherein the resonator ~~to~~ exhibits a material-based frequency isotropy ~~(~~$\Delta f_m = 0$~~)~~, and

wherein the crystalline material is chosen from the following:

a) a crystalline material of tetragonal (1) or tetragonal (2) structure cut in the [001] plane, the resonator then exhibiting material-based frequency isotropy in the 3rd-order vibration mode;

b) a crystalline material of trigonal (1) or trigonal (2) structure cut in the [001] plane, the resonator then exhibiting material-based frequency isotropy in the 2nd-order vibration mode;

c) a crystalline material of hexagonal structure cut in the [001] plane, the resonator then exhibiting material-based frequency isotropy in both the 2nd- and 3rd-order vibration modes; ~~and~~

d) a crystalline material of cubic structure other than silicon,

i) cut in the [111] plane ~~(silicon excluded)~~, the resonator then exhibiting material-based frequency isotropy in the 2nd-order vibration mode, or

ii) cut in the [001], ~~[100] (silicon excluded)~~ or [010] planes, the resonator then exhibiting material-based frequency isotropy in the 3rd-order vibration mode, and

e) a crystalline material of cubic structure cut in the [100] plane, the resonator then exhibiting material-based frequency isotropy in the 3rd-order vibration mode.

3. (new) A method for producing a mechanical resonator with a planar monolithic vibrating structure machined in a crystalline material, comprising the steps of:

when the crystalline material is chosen from crystalline materials of trigonal (1) or trigonal (2) structure, this material is cut in the [001] plane, and the 2nd-order vibration mode is then used,

when the crystalline material is chosen from crystalline materials of tetragonal (1) or tetragonal (2) structure, this material is cut in the [001] plane, and the 3rd-order vibration mode is then used,

when the crystalline material is chosen from crystalline materials of hexagonal structure, this material is cut in the [001] plane, and the 2nd-order or 3rd-order vibration mode is then used, and

when the crystalline material is chosen from crystalline materials of cubic structure, it is cut in the [001] or [010] plane, and the 3rd-order vibration mode is then used,

whereby the resonator exhibits natural material-based frequency isotropy $\Delta f_m = 0$.

4. (new) A mechanical resonator with a planar monolithic vibrating structure machined in a crystalline material,

wherein the resonator exhibits a material-based frequency isotropy $\Delta f_m = 0$, and

wherein the crystalline material is chosen from the following:

a) a crystalline material of tetragonal (1) or tetragonal (2) structure cut in the [001] plane, the resonator then exhibiting material-based frequency isotropy in the 3rd-order vibration mode;

b) a crystalline material of trigonal (1) or trigonal (2) structure cut in the [001] plane, the resonator then exhibiting material-based frequency isotropy in the 2nd-order vibration mode;

c) a crystalline material of hexagonal structure cut in the [001] plane, the resonator then exhibiting material-based frequency isotropy in both the 2nd- and 3rd-order vibration modes; and

d) a crystalline material of cubic structure cut in the [100] plane, the resonator then exhibiting material-based frequency isotropy in the 3rd-order vibration mode.